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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/270,039	03/16/1999	JUDY H HUANG	AMAT/3434/PD	1949

7590 04/25/2002

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EXAMINER

FOURSON III, GEORGE R

ART UNIT	PAPER NUMBER
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2823

DATE MAILED: 04/25/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Applicati n No.

09/270,039

Applicant(s)

HUANG, JUDY H

Examiner

George Fourson

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2000.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 14-31 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 14-31 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3,5,6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

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The finality of the office action mailed 12/18/01 is withdrawn in view of applicant's arguments and the new grounds of rejection below.

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. Claims 14-28,30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Endo et al '150, Europe '440, Wang et al '947, Somekh and Zhao.

Endo discloses formation of SiC by plasma deposition at 50-500°C on silicon using methylsilane as source gas and helium carrier gas at 0.05-10 Torr exemplifying use of 100 W Rf power to create the plasma. The reference does not disclose depositing a layer over the SiC layer or the dielectric constant of the SiC layer produced.

Europe '440 discloses plasma deposition of a SiC barrier layer using methylsilane as source gas at 0.1-5 W/cm² at 50-600°C on a dielectric layer followed by formation of a metal layer on the SiC layer. The reference also discloses that the layers 5 and 9 can be SiC (col.4). The choice of particular conditions to form the SiC layer would have been a matter of routine optimization within the teachings of the references. The SiC layer so produced would have the recited dielectric constant and reflectivity because the same materials would be treated in the same manner as in the instant invention. The choice of particular thicknesses of layers used would have depend on the desired device dimensions and device characteristics on the finished wafer and therefore would have been a matter of routine optimization.

Applicant admits the formation of SiC as an antireflective layer to have been known prior to applicant's invention.

The combination of Endo et al '150 and Europe '440 does not include formation of a SiC barrier layer, a dielectric layer on the SiC barrier layer, a SiC etch stop on the dielectric layer, a second dielectric layer on the etch stop, etching the first and second dielectric layers to form a damascene structure, forming a liner layer in the damascene structure, forming a conductive material layer and depositing a SiC barrier layer on the Cu layer.

Applicant admits in U.S. Application S.N. 09/165,248, figure 1, the process of forming a barrier layer 13, a dielectric layer 14 on the barrier layer, an etch stop 16 on the dielectric layer, a second dielectric layer 18 on the etch stop, etching the first and second dielectric layers, forming a TaN liner layer 22, forming a Cu conductive material layer 20 and depositing a barrier layer on the Cu layer to have been known prior to applicant's invention.

Europe '440 discloses that the SiC produced by the process therein is useful as useful as barrier layer 4, interlayer dielectric layers 5 and 9 and barrier layer 8. Somekh discloses forming SiC, low k etch stop 14 between dielectric layers (col.5, lines 33-41). Zhao discloses forming SiC etch stop 312 between dielectric layers (col.5, lines 55-61). In view of the disclosures of Europe '440, Somekh and Zhao that SiC is useful as a dielectric layer, barrier layer and etch stop, it would have been within the scope of one of ordinary skill in the art to combine the teachings of Endo et al '150, Europe '440 and Wang et al with those of either one of Somekh and Zhao to enable formation of the structure of prior art figure 1 discussed above.

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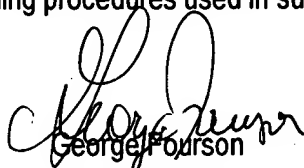
Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Endo et al '150, Europe '440, Wang et al '947, Somekh and Zhao as applied to claims 14-28,30 and 31 above, and further in view of Subrahmanyam et al.

The combination does not include nitrogen/hydrogen plasma cleaning. Subrahmanyam et al discloses nitrogen/hydrogen plasma cleaning of metallization exposed by a via to remove oxides by reduction thereby decreasing contact resistance (col.7, lines 48-54). It would have been within the scope of one of ordinary skill in the art to combine the teachings of the combination and Subrahmanyam et al to achieve reduction of contact resistance.

Any inquiry of a general nature or relating to the status of this application should be directed to the Group Receptionist whose telephone number is (703) 308-0956. See MPEP 203.08.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner George Fourson whose telephone number is (703) 308-2544. The examiner can normally be reached on Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael Fahmy can be reached on (703) 308-4918. The fax number for this group is (703)308-7722(7724,3431 and 3432). MPEP 502.01 contains instructions regarding procedures used in submitting responses by facsimile transmission.


George Fourson
Primary Examiner
Art Unit 2823

GFourson
March 28, 2002